

An Architecture to Promote the Commercialization of Space Mission Command and Control

Topic: Cost Efficient Operations
Alternative Topic: Standardisation ,
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Abstract

Increased potential for making profits in near-earth space from personal communications devices, satellite TV and radio, satellite-based navigation systems as well as in more mature satellite point-to-point communication services will increase demand for cost-effective satellite command and control techniques and facilities. Shrinking government budgets are causing planners of government-funded space missions to look for cheaper ways to command and control their missions. Government funded space mission tracking facilities in the U.S. are beginning to market their capabilities to private interests in an attempt to gain additional funding. Continued reduction of costs for command and control in the space mission operations depends on a competitive set of private industry command and control products that will serve both private industry and government missions in space.

This paper describes a command and control architecture that encompasses space mission operations centers, ground terminals, and spacecraft. This architecture is intended to promote the growth of a lucrative space mission operations command and control market through a set of open standards used by both government and profit-making space mission operators. The demand for command and control capabilities compliant with these standards will lead to a diverse set of commercial products that can then be integrated to produce command and control systems. These commercial products will be available to support operations center, ground terminal, and spacecraft development and ground terminal and spacecraft operations. Standards-based commercial products already exist in markets that are similar to space mission applications (e.g., industrial process control applications). Mass marketed commercial products are cheaper to acquire, operate, and maintain and are more reliable than different "home-grown" capabilities produced by each individual space mission operation agency or center. This architecture features (1) layered design and implementation, (2) open standard interface specifications, (3) abstract models of the characteristics and behaviors of ground and flight devices and applications that are to be controlled, (4) portable automation between ground and flight segments, and (5) capabilities drawn from industrial process control applications.